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ABSTRACT

This paper reports on research conducted to determine whether there is a statistically significant difference between the achievement test scores of students who enter first grade as 5-year-olds, and those who enter first grade as 6-year-olds. Ex post facto research was conducted on 3 samples of students (17,000 from 1st grades, 17,500 from 4th grades, 19,450 from 8th grades) in Kentucky schools. Pupil test scores for each sample on the Comprehensive Tests of Basic Skills (CTBS) total reading, total math, total language, and total battery were compared. A t test for independent samples was applied to each of the four kinds of scores (reading, math, language, battery) for the three different grade levels. In addition, each sample was further subdivided into two groups according to sex in order to determine if probable achievement differences at all three levels were consistent among both boys and girls. Results indicate that students entering the first grade as 6-year-olds had significantly higher achievement scores at both the 1st grade and 4th grade levels than did students who entered 1st grade as 5-year-olds. At the 8th grade level, 6-year-old entrants scored higher in only one area (reading), and findings seem to indicate that the difference observed in 8th grade reading scores may be more a function of sex than of first grade entrance age. Numerous tables are included. (CM)

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DOES AGE OF ENTRY INTO FIRST GRADE AFFECT STUDENTS' ACHIEVEMENT IN SCHOOL?

(Technical Report)

Prepared by

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July, 1978

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INTRODUCTION

The 1978 Kentucky Legislature enacted legislation, HB 192 School Age Bill, which changed the age a child must be to enter school in the first grade. Prior to the enactment of this legislation, a child reaching his or her sixth birthday on or before December 31 of any given year was eligible to enter the first grade at the beginning of that particular school term. HB 192 revised this legislation to read that a child reaching his or her sixth birthday prior to September 1 was eligible to enter the first grade. The intent seems to be to eliminate five-year-old children from the first grade with the exception of those who meet the "readiness test criteria." The nature of the "readiness test" and appropriate criteria have not been established as of this date.

Several motivating forces would seem to have been influential in passing this bill. One of the more important was the concern expressed in numerous formats over five-year-old children entering first grade. There has long been some feeling among Kentucky educators that many five-year-old children are not "ready" for the first grade. Although seldom verbalized, this belief implies that a child entering the first grade as a five-year-old will not achieve as well as would have been the case had the child not entered the first grade until the age of six. Thus, the problem with which this project is concerned is to determine if children who enter the first grade as five-year-olds achieve differently than do those who enter the first grade as six-year-olds. Five-year-old students are those born on or after September 1 of a given year. Six-year-old students are those born prior to September 1 of a given year.

Problem Statement

Is there a statistically significant difference between the achievement test scores of students who enter the first grade as five-year-olds (students whose birthdays fall between September 1 and December 31) and those who enter the first grade as six-year-olds (students whose birthdays fall between January 1 and August 31)? This statement could be further expanded to include the relationships between achievement test scores and age throughout the school years.

Hypothesis

The hypothesis to be tested in this case, stated in the null form is:

> There is no statistically significant difference between the achievement test scores of students who enter the first grade as five-year-olds and those who enter the first grade as six-year-olds.

Review of Literature

Much has been written and published concerning the correlation between maturity and academic achievement. Research has been conducted using a broad range of subjects, from pre-school children to mature college students. These have resulted in a diversity of conclusions and implications. Prediction of achievement,

however, is still a rather difficult task at best. There seems to be a considerable number of useful summaries of studies but there are very few generalizations (Baird, 1969).

Research has shown that mature college freshmen (24 - 50 years of age) did considerably poorer on the College Qualifying Test than did their younger counterparts. However, the more mature group had the highest grade point average (GPA) during all grading periods (Perkins, 1968). Perkins attributed their success to "motivation and prior experience (maturity)." Baron (1969), however, found age not to be a significant factor in differentiating between successful and unsuccessful students.

Hull (1970) conducted research using a random sample of female freshman college students. The sample was divided into two groups, one of traditional college-age freshmen, (18 - 19 years of age) and the other of older, more mature students. For each group a grade index (GI) was computed and a correlation ran between the GI and GPA. The older group was significantly different from zero, while there was no significant difference in the correlation for the younger group.

Halfter (1962) feels age may be a poor index of expected performance; that functional age may be more useful than chronological age. This thesis is supported by Beattie (1970) in his review and summary of over 20 studies relating entrance age to academic success and personality development. His review indicates that not only chronological age, but mental age, adjustment, and IQ are determining factors in success. Although achievement is related to entrance age, this does not mean that raising the minimum entrance age would prove profitable. In research on early entry as related to school adjustment, findings reported showed a greater percentage of children who entered kindergarten or first grade at an early age had adjustment problems greater than those compared to later entrants. In other studies, early entrants had more speech defects, nervous indications, and personal and social maladjustments than did older entrants.

From the review of literature, it is quite evident that there have been no studies done which would be generalizable to Kentucky. There seem to be two groups of educators in this area with two separate schools of thought based on quasi-research endeavors. At one end of this broad range are those who favor early school entrants (Ahr, 1967) and can document superiority of performance. At the other end of the range are those who have tried early entrance and have given it up (Mawhinney, 1964). This latter study showed that nearly one-third of the early entrants were said to be poorly adjusted. Only about one out of twenty was judged to be an outstanding leader. Only about one in four was superior academically; and one in four was either below average or had repeated a grade.

METHODOLOGY

In an attempt to determine what kind of an effect this changing of entrance age might have on achievement test scores, the Research Unit of the Office of Research and Planning, Kentucky State Department of Education, embarked on a research endeavor using ex post facto research. Kerlinger (1973) defines ex post facto research as:

> "... systematic empirical inquiry in which the scientist does not have direct control of independent variables because their manifestations have already occurred or because they are inherently not manipulable. Inferences about relations among variables are made, without direct intervention, from concomitant variation of independent and dependent variables."

Kerlinger cautions that this type of research is most dangerous in that it results in assumptions that lead to erroneous and misleading interpretations of research data. Despite its weaknesses, much ex post facto research must be done in education as well as other behavioral science fields, because many research problems in these areas do not lend themselves to experimental inquiry.

The descriptive research required to supply the Kentucky State Department of Education with at least a partial answer to the question demands that we utilize ex post facto research. However, it is important to bear in mind that we must treat the results and interpretation of the data with great care and caution.

Sample

Three samples of students were considered separately. They were taken from the first, fourth, and eighth grades of Kentucky schools respectively. Each of the three samples included those students on file with the State Department of Education as having participated in the free scoring service offered by the Department in the Spring of 1977.

The first grade sample consisted only of those students born in 1970, the fourth grade sample of those students born in 1967, and the eighth grade sample of those students born in 1963. This resulted in a sample of approximately 17,000 at the first grade, 17,500 at the fourth grade, and 19,450 at the eighth grade. In the analysis which will be described in greater detail, pupil test scores for each sample on the Comprehensive Tests of Basic Skills (CTBS) total reading, total math, total language, and total battery were compared to see if students who had entered the first grade as five-year-olds achieved differently than did those who entered first grade as six-year-olds. Because of missing data in a few cases, the sample within a given grade level can vary slightly when comparing the four test scores.

Because districts voluntarily participate in the free scoring serivce, the sample cannot be considered random unless one assumes that districts volunteer on a random basis. Thus, the sample is representative of Kentucky to the extent that districts (LEA's) participate in the free scoring service on a random basis.

Procedure

The problem, as previously stated, was to determine if students entering the first grade as five-year-olds achieved differently than did those entering as six-year-olds. The terms five-year-old and six-year-old have already been defined.

Achievement, of course, can be mentioned at different points during a child's education. For purposes of this study, it was decided to check for possible differences at first, fourth, and eighth grades. The fourth and eighth grades were selected because the Statewide Scoring Service of the State Department of Education emphasizes free scoring at the fourth and eighth grades. Free scoring is also offered at the eleventh grade, but it was not thought necessary to monitor at this level at this time. Eleventh graders would be further removed from the problem. Their ages tend to differ more, distributing them over a greater period of time during which they could have entered school. First grade information was also readily available through the free scoring service.

Achievement for purposes of this study has been defined as a student's scores on CTBS reading, language, math, and total battery. At the first grade level, CTBS Form S was used. At the fourth and eighth grade levels, CTBS Form Q was used.

A t test for independent samples was applied to each of the four kinds of scores (reading, language, math, and total battery) for the three different grade levels of interest. Thus, twelve separate analyses were necessary. SAS PROC T TEST (Barr, 1976) was used to compute the statistics reported in the next section.

Due to the numerous studies indicating differences among girls and boys in levels of achievement in the early elementary grades, subanalyses of each of the three major analyses previously mentioned were also undertaken. Each sample was subdivided into two groups according to sex. This was done to see if those differences or the lack of differences observed in the total first, fourth, and eighth grade samples were consistent among both boys and girls.

Analysis of First Grade Achievement

Table 1 summarizes the findings which were obtained by analyzing CTBS Form S, Level B, test scores of the 1977 first grade class. Only those students who were born in 1970 were included in this analysis. It is assumed that all first graders of the 1977 first grade class born in 1970 before September 1 entered at six years of age. Those born on September 1, 1970, or after, were assumed to have entered first grade at five years of age. Students born before 1970 either entered school at a later age or were retained for some reason. It is probable that some of those 1976-77 first graders reporting 1969 birth years were born after September 1 of that year, making them six years of age when entering the 1976-77 first grade class. These students were not included in this study because there is no way of determining from State Department of Education records if such a student was entering the first grade for the first time or was held back and was entering a second time. This study will assume that all students who may have been retained one or more years were eliminated.

The t values reported in the tables in this section are the "students t" for testing the difference between means of two independent samples. The assumption is made that the variances of achievement within the two populations (five-year-old and six-year-old) are equal. Those t values followed by an asterisk are significant beyond the .01 level.

A decision was made that before a difference between five-year-olds entering first grade would be considered statistically significant, the probability of obtaining a given t value by chance alone must be less than, or equal to, .01.

All four t values reported in Table 1 were significant beyond the .01 level. A positive t value is an indication that six-year-olds achieved at a higher level than did five-year-olds entering the first grade. This is a result of the manner in which the null hypothesis was stated in mathematical terms.

(H_o: [Six-year-old mean achievement] - [Five-year-old mean achievement] = 0.)

At the first grade level, six-year-old achievement was significantly higher than five-year-old achievement in total achievement, reading achievement, language achievement, and math achievement.

The first grade sample was subdivided by sex. The results for first grade boys are included in Table 2. The results for the girls are included in Table 3. As can be observed, the results for both boys and girls are similar. Six-year-old boys entering first grade achieve at a higher level than do boys entering first grade as five-year-olds. Six-year-old girls tend to score higher than five-year-old girls. These results are consistent with the findings of the total first grade sample and support the findings of previous studies (Baer, 1958; Hampleman, 1959; Binkley, 1967; and Beattie, 1970).

TABLE 1: COMPARISON OF FIRST GRADE ENTRANCE AGE AND FIRST GRADE ACHIEVEMENT

	Age	Mean Raw Score	S.D.	N	t
Total Battery	5	107.7	33.1	5,495	15.0 *
	6	115.8	32.8	11.537	
Reading	5	51.6	18.4	5,504	11.4 *
	6	55.0	18.3	11,584	
Language	5	24.6	6.0	5,488	14.1 *
	6	25.9	5.8	11,532	
Math	5	31.9	11.8	5,495	16.0 *
	6	35.0	12.0	11,537	

* Significant at the .01 level

TABLE 2: COMPARISON OF FIRST GRADE ENTRANCE AGE AND FIRST GRADE ACHIEVEMENT AMONG BOYS

	Age	Mean Raw Score	S.D.	N	t
Total Battery	5	103.0	33.3	2,737	11.4 *
	6	111.8	33.2	5,834	
Reading	5	48.6	18.4	2,731	8.7 *
	6	52.4	18.4	5,857	
Language	5	23.9	6.3	2,730	10.9 *
	6	25.4	6.0	5,831	
Math	5	31.0	11.8	2,737	11.9 *
	6	34.3	12.2	5,834	

* Significant at the .01 level

TABLE 3: COMPARISON OF FIRST GRADE ENTRANCE AGE AND FIRST GRADE ACHIEVEMENT AMONG GIRLS

	Age	Mean Raw Score	S.D.	N	t
Total Battery	5	112.3	32.3	2,758	10.2 *
	6	119.8	31.9	5,703	
Reading	5	54.5	18.0	2,773	7.8 *
	6	57.8	17.8	5,727	
Language	5	25.2	5.7	2,758	9.3 *
	6	26.4	5.5	5,701	
Math	5	32.8	11.6	2,758	10.8 *
	6	35.8	11.8	5,703	

* Significant at the .01 level

One observation which can be made from Tables 2 and 3 is that girls tend to score higher on achievement tests than do boys. For purposes of convenience, the means of boys and girls for both populations are summarized in Table 4. Girls consistently score higher than boys at the first grade level.

TABLE 4: MEAN ACHIEVEMENT FOR 1976-77 FIRST GRADERS BY SEX AND FIRST GRADE ENTRANCE AGE

	Five-Year-Olds		Six-Year-Olds	
	BOYS	GIRLS	BOYS	GIRLS
Total Achievement	103.0	112.3	111.8	119.8
Reading Achievement	48.6	54.5	52.4	57.7
Language Achievement	23.9	25.2	25.4	26.4
Math Achievement	31.0	32.8	34.3	35.8

Differences such as those illustrated in Table 4 are not uncommon. These findings substantiated findings by Baer (1958). He found that girls consistently received higher achievement test scores than their male counterparts. Those associated with educational measurement have long been aware of the differences in the achievement levels of boys and girls at the early elementary levels. This known pattern of early elementary achievement prompted the subdivision of the three samples (first, fourth, and eighth grades) according to sex. This was necessary in order to assure that any differences which might be noted among age groups would also be noted among sexes.

Analysis of Fourth Grade Achievement

The analysis of fourth grade achievement revealed findings very similar to those shown in the analysis of the first grade achievement scores. Again, statistically significant differences were found between students who entered the first grade as five-year-olds and those entering the first grade as six-year-olds. Like the first grade sample, the students were divided into two groups: Those who entered the first grade as five-year-olds, and those entering the first grade as six-year-olds. The five-year-old subsample was defined as those 1976-77 fourth graders who were born between September 1 and December 31 of 1967. The six-year-old subsample was defined as the 1976-77 fourth graders who were born between January 1 and August 31 of 1967.

The results of the analysis of the total fourth grade sample are summarized in Table 5. Similar to the first grade analysis, the fourth grade sample was subdivided according to sex.

The results of the analysis of the male subsample are summarized in Table 6 and the results of the female subsample in Table 7. As the tables indicate, the pattern of significant differences is consistent among boys and among girls. Statistically significant differences were found in total battery, reading, language, and math scores. Students entering the first grade as six-year-olds had significantly higher achievement scores at the fourth grade level than did fourth graders who entered the first grade as five-year-olds.

TABLE 5: COMPARISON OF FIRST GRADE ENTRANCE AGE AND FOURTH GRADE ACHIEVEMENT

	Age	Mean Raw Score	S.D.	N	t
Total Battery	5	148.1	43.7	4,965	7.7 *
	6	153.8	45.1	12,565	
Reading	5	46.7	15.3	5,031	7.6 *
	6	48.7	15.9	12,709	
Language	5	46.6	15.4	5,000	5.9 *
	6	48.1	15.7	12,672	
Math	5	54.5	16.8	5,003	7.6 *
	6	56.7	17.1	12,670	

* Significant at the .01 level

TABLE 6: COMPARISON OF FIRST GRADE ENTRANCE AGE AND FOURTH GRADE ACHIEVEMENT AMONG BOYS

	Age	Mean Raw Score	S.D.	N	t
Total Battery	5	141.6	45.0	2,239	5.5 *
	6	148.0	46.5	6,006	
Reading	5	45.2	15.7	2,265	5.3 *
	6	47.3	16.6	6,075	
Language	5	43.1	15.7	2,255	4.9 *
	6	45.0	15.9	6,053	
Math	5	53.1	17.3	2,255	5.1 *
	6	55.3	17.7	6,063	

* Significant at the .01 level

TABLE 7: COMPARISON OF FIRST GRADE ENTRANCE AGE AND FOURTH GRADE ACHIEVEMENT AMONG GIRLS

	Age	Mean Raw Score	S.D.	N	t
Total Battery	5	153.4	41.9	2,726	6.0 *
	6	159.2	43.1	6,559	
Reading	5	48.0	14.7	2,766	6.0 *
	6	50.0	15.2	6,634	
Language	5	49.5	14.6	2,745	4.5 *
	6	51.0	15.0	6,619	
Math	5	55.7	16.2	2,748	6.1 *
	6	57.9	16.4	6,607	

* Significant at the .01 level

Analysis of Eighth Grade Achievement

The eighth grade students tested in the Spring of 1977 were divided in the same manner as used in the first and fourth grade analyses. Five-year-old students entering first grade were defined as 1976-77 eighth grade students who were born between September 1 and December 31 of 1963. Six-year-olds entering first grade were defined as those 1976-77 eighth graders born between January 1 and August 31 of 1963.

The results of the total eighth grade sample are summarized in Table 8. The previously discussed patterns of statistically significant differences between five-year-olds entering first grade and six-year-olds entering first grade found at the first and fourth grade levels of achievement were not so clearly evident at the eighth grade level. Again, in order for a difference to be considered statistically significant, the probability of having obtained a t value of a given magnitude must be less than .01. At the first and fourth grade levels, statistically significant differences were observed in all four measures of achievement: reading, language, math and total battery scores. Six-year-olds entering first grade consistently scored higher than students who entered the first grade as five-year-olds. At the eighth grade level, a statistically significant difference was observed in only reading achievement scores, where six-year-olds entering first grade again scored higher than five-year-old entrants. Using the above-mentioned definition of statistical significance, the observed differences in language, math, and total battery scores were not significant and thus, the null hypothesis is not rejected.

H_o: Students entering first grade as five-year-olds score the same as six-year-olds entering the first grade when they reach the eighth grade.

The only area of achievement where the null hypothesis could be rejected is in the area of reading. It might be pointed out that in the areas of math and total battery scores, the probability of obtaining the associated t values was very close to the .01 criterion for rejecting the null hypothesis (.0103 for math and .0338 for total battery scores.)

The eighth grade sample was also subdivided according to sex, with the male subsample summarized in Table 9 and the female subsample summarized in Table 10. As can be observed, no statistically significant differences were observed. Thus, the one significant difference observed in the total eighth grade sample (reading) is no longer apparent when male and female scores are analyzed separately. These findings would seem to indicate that the difference observed in eighth grade reading levels is more a function of sex than a function of first grade entrance age.

TABLE 8: COMPARISON OF FIRST GRADE ENTRANCE AGE AND EIGHTH GRADE ACHIEVEMENT

	Age	Mean Raw Score	S.D.	N	t
Total Battery	5	173.3	44.4	5,518	2.1
	6	174.8	45.8	13,930	
Reading	5	53.8	15.3	5,568	2.6 *
	6	54.4	15.8	14,079	
Language	5	53.7	14.6	5,558	.6
	6	53.9	14.7	14,081	
Math	5	65.5	18.6	5,559	2.6
	6	66.2	19.2	14,064	

* Significant at the .01 level. (If no asterisk appears, mean difference is considered insignificant)

TABLE 9: COMPARISON OF FIRST GRADE ENTRANCE AGE AND EIGHTH GRADE ACHIEVEMENT AMONG BOYS

	Age	Mean Raw Score	S.D.	N	t
Total Battery	5	166.3	46.8	2,407	2.1
	6	168.7	47.8	6,566	
Reading	5	52.7	16.2	2,428	2.3
	6	53.6	16.7	6,634	
Language	5	49.6	15.1	2,426	1.0
	6	49.9	15.2	6,636	
Math	5	63.8	19.4	2,425	2.1
	6	64.8	19.8	6,632	

* Significant at the .01 level (If no asterisk appears, mean difference is considered insignificant)

TABLE 10: COMPARISON OF FIRST GRADE ENTRANCE AGE AND EIGHTH GRADE ACHIEVEMENT AMONG GIRLS

	Age	Mean Raw Score	S.D.	N	t
Total Battery	5	178.7	41.6	3,111	1.8
	6	180.3	43.3	7,364	
Reading	5	54.6	14.5	3,140	1.7
	6	55.2	14.9	7,445	
Language	5	56.9	13.3	3,132	1.4
	6	57.4	13.4	7,445	
Math	5	66.7	17.8	3,134	2.0
	6	67.5	18.5	7,432	

* Significant at the .01 level. (If no asterisk appears, mean difference is considered insignificant)

SUMMARY AND CONCLUSIONS

The discussion of the test scores analyzed in this study has, to this point, been centered around the raw scores. Raw scores on the Comprehensive Test of Basic Skills, as is the case with most tests, refer merely to the number of items responded to correctly. As previously discussed, raw scores were used to determine how students who enter the first grade as five-year-olds differ from six-year-olds on achievement at the first, fourth, and eighth grades. All students included in this study were tested in the Spring of 1977. Bearing in mind the danger which exists by making assumptions based on the results of ex post facto research, one must be careful in drawing conclusions from this data. However, if one accepts the assumption that the sample on which this study is based is representative of the state, several conclusions would seem apparent.

1. Age of entrance into the first grade does make a difference in achievement levels at the first grade level as measured by CTBS. Six-year-olds score significantly higher than five-year-olds entering first grade on reading, language, math and total battery.

2. Entrance age in the first grade would also seem to cause a significant difference in fourth grade achievement. Six-year-olds entering first grade again scored significantly higher at the fourth grade level than did five-year-olds entering the first grade.

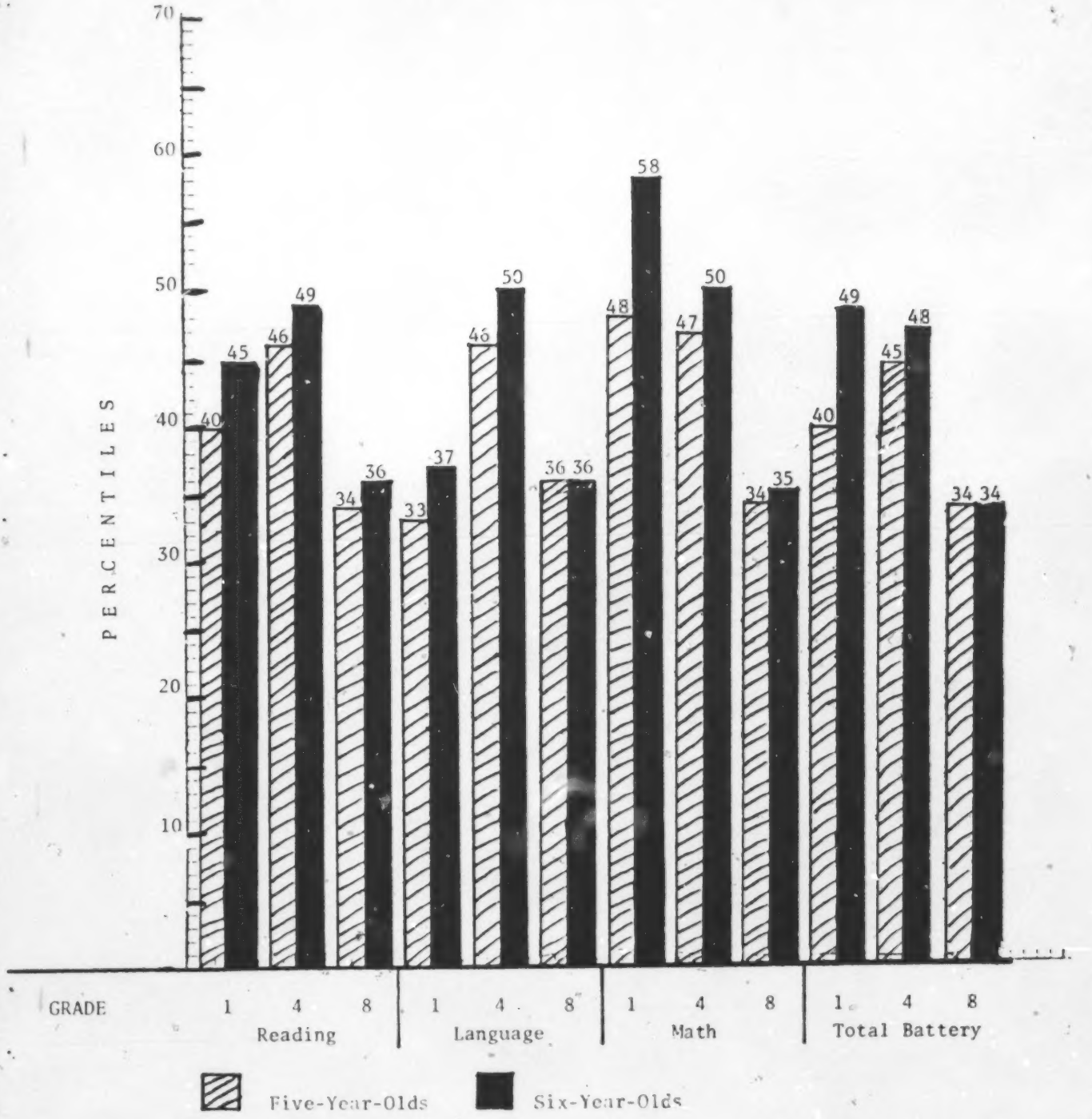
3. Age of entrance into the first grade made a significant difference in eighth grade achievement in only one area, that of reading. The other three scores considered in this study, language, math, and total battery, resulted in differences between five-year-old and six-year-old first grade entrants which were too small to conclude that they were significant to the degree of probability utilized in this study.

These differences can be graphically portrayed in terms of normative (or derived) scores. Most nationally normed tests such as CTBS derive percentile ranks which give an indication as to how a particular pupil or group of pupils relate to the national norming population.

Figure 1 presents the observed differences in achievement at the first, fourth, and eighth grades between five-year-olds entering the first grade and six-year-olds entering the first grade. These differences are portrayed in terms of percentiles. Five-year-old scores are represented by the bars with the diagonal lines in them, and six-year-old scores are represented by the solid colored bars.

A feature of primary importance portrayed in this figure is the difference between the striped and solid bars at each grade level. The actual percentiles represented in this graph may be of interest to some, but the focus of this study is on the "difference" in the achievement of five-year-olds entering first grade and six-year-olds entering first grade. Under certain assumptions, the gap between a striped and solid bar can be considered to represent the expected gain in Kentucky's achievement levels if all students are required to reach age six before entering first grade.

FIGURE 1: A GRAPHIC COMPARISON OF ACHIEVEMENT OF FIVE-YEAR-OLDS AND SIX-YEAR-OLDS ENTERING FIRST GRADE



* Keep in mind that grade one conversions are based on CTBS Form S norms and grades four and eight are based on CTBS Form Q norms.

These assumptions are necessary because there are a number of intervening variables which would logically affect the achievement of all students which are beyond the scope of this study. For example, there is reason to believe that elementary students who attend kindergarten will achieve at higher levels than those who do not. In terms of this study, the assumption has to be made that approximately equal percentages of five-year-olds and six-year-olds entering first grade attended kindergarten. This information is not presently available for the sample used in this study and there are other variables known to impact achievement, such as socio-economic status. Again, the impact of this variable on the sample is unknown. Thus, the assumption must be made that parents of differing social-economic groups have similar habits relating to when they enroll their children in the first grade.

If one assumes that all factors other than age of entrance into the first grade are equal among five-year-olds and six-year-olds, the following conclusions could be drawn from this study:

1. Achievement at the first and fourth grade levels as measured by CTBS will increase if the required entrance age for first graders is increased to six years of age.

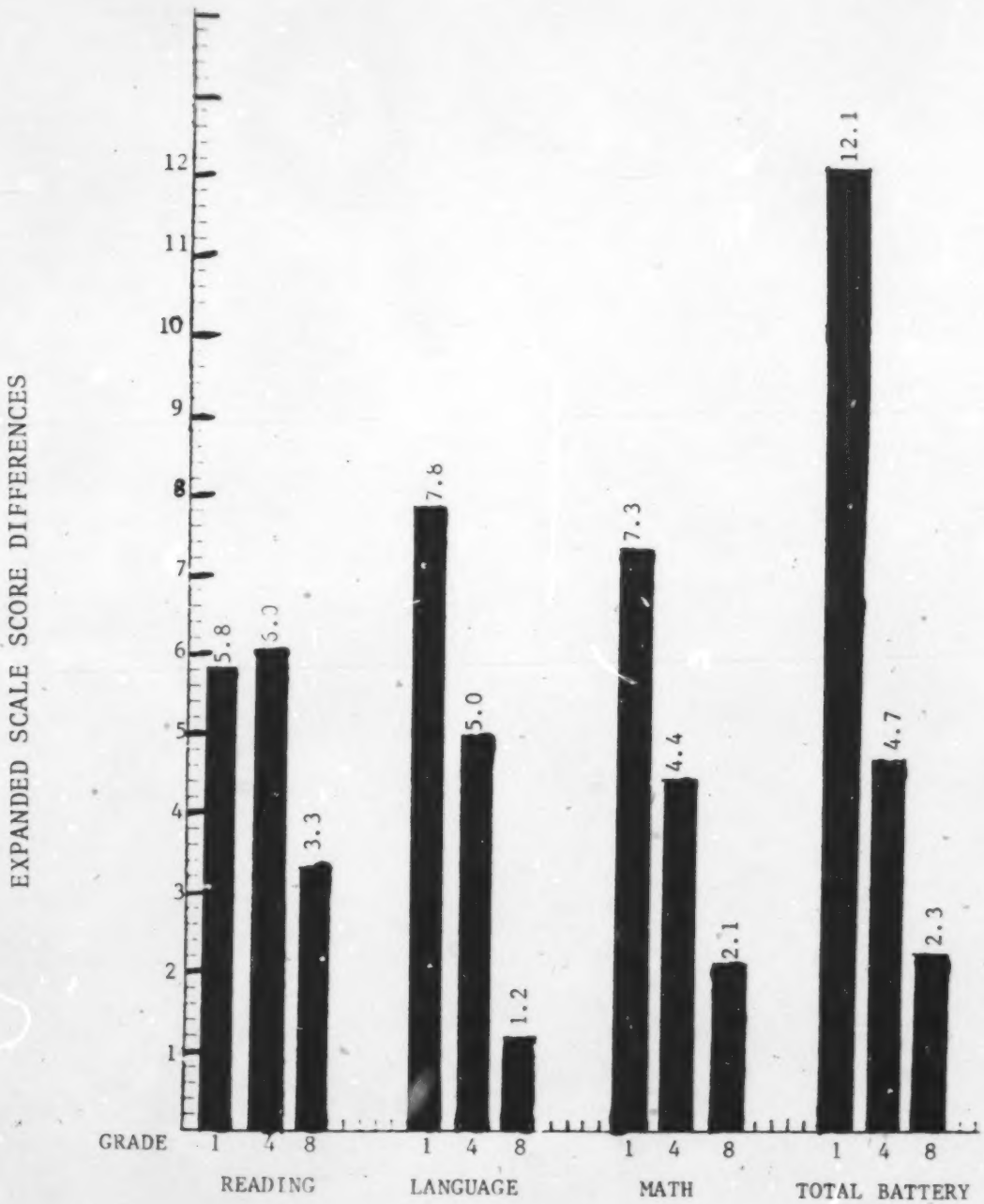
2. Only reading scores measured by CTBS at the eighth grade level are likely to increase notably if first grade entrance age is raised to six years of age.

3. Eighth grade achievement as indicated by CTBS language, math, and total battery scores is not likely to increase significantly.

These expected outcomes can be better understood by considering Figure 2. In this figure, the difference between five-year-olds entering first grade and six-year-olds entering th e first grade in terms of CTBS Expanded Standard Scores is shown. The CTBS Expanded Standard Scores are described as equal interval and comparable from grade to grade. Thus, the difference between achievement at the first frade of five-year-olds entering the first grade and six-year-olds entering the first grade can be compared to fourth or eighth grade differences between five-year-old and six-year-old entrants. The mean raw scores which were used and reported in the analyses (Table 11) have been converted to CTBS Expanded Scores and are reported in Table 12. The data presented in Table 12 were used to calculate expanded scale score differences between five-year-old and six-year-old first grade entrants which are depicted in Table 13. In looking at Table 13, one can see the difference between five-year-old and six-year-old first grade entrants on total battery at the first grade level as 12.1 as was depicted in Figure 2. At the eighth grade level, this difference was only 2.3.

The significant and insignificant findings discussed previously become more meaningful when looking at this graph (Figure 2). As indicated, the numbers below each bar indicates grade. The length of the bar represents the difference between five-year-old and six-year-old first grade entrants. In all cases, six-year-old entrants score somewhat higher than five-year-olds. However, by the time they reach the eighth grade, only the difference in reading achievement are still significant. This becomes evident in comparing the lengths of the bars representing eighth grade differences. The bar appearing in the reading portion of the graph is longer than the other three eighth grade bars.

FIGURE 2: GRAPHIC PORTRAYAL OF CTBS EXPANDED SCALE SCORE DIFFERENCES BETWEEN THE MEAN SCORES OF FIVE-YEAR-OLDS ENTERING FIRST GRADE AND SIX-YEAR-OLDS ENTERING FIRST GRADE



*Keep in mind that grade one conversions are based on CTBS Form S norms and grades four and eight are based on CTBS Form Q norms.

TABLE 11: MEAN RAW SCORES FOR FIVE-AND SIX-YEAR-OLDS ENTERING FIRST GRADE AT FIRST, FOURTH, AND EIGHTH GRADES

	AGE	1st Grade	4th Grade	8th Grade
Reading	5	51.6	46.7	53.8
	6	55.0	48.7	54.5
Language	5	24.6	46.6	53.7
	6	25.9	48.1	53.9
Math	5	31.9	54.5	65.5
	6	35.0	56.7	66.2
Total Battery	5	107.7	148.1	173.3
	6	118.8	153.8	174.8

TABLE 12: MEAN EXPANDED STANDARD SCORES FOR FIVE-AND SIX-YEAR-OLDS ENTERING FIRST GRADE AT FIRST, FOURTH, AND EIGHTH GRADES

	AGE	1st Grade	4th Grade	8th Grade
Reading	5	252.2	413.1	520.2
	6	258.0	419.1	523.5
Language	5	261.6	416.4	527.2
	6	269.4	421.4	528.4
Math	5	259.7	397.0	509.5
	6	267.0	401.4	511.6
Total Battery	5	203.7	394.1	510.3
	6	215.8	398.8	512.6

TABLE 13: EXPANDED SCALE SCORE DIFFERENCES BETWEEN FIVE-YEAR-OLD AND SIX-YEAR-OLD FIRST GRADE ENTRANCE

	1st Grade	4th Grade	8th Grade
Reading	5.8	6.0	3.3
Language	7.8	5.0	1.2
Math	7.3	4.4	2.1
Total Battery	12.1	4.7	2.3

In summary, achievement gains would be expected to be greatest in the areas measured by CTBS language, math and total battery scores. The greatest gain by six-year-old entrants appear at the first grade with somewhat less, but still significant gains at the fourth grade level. If any gain is apparent at the eighth grade level, as a result of changing first grade entrance age, it would probably be a function of chance as significant gains should be expected. In the area of reading achievement, expectations are slightly different. As can be seen in Figure 2, similar amounts of gain would be expected at the first and fourth grades as a result of entrance age changes. A small but still significant gain in CTBS reading scores would be expected at the eighth grade level.

Over the past several years the students of Kentucky have consistently scored above the national norms at the fourth grade level while eighth and eleventh grade scores are consistently below the norms. A change in first grade entrance age should not be expected to significantly alter Kentucky's eighth grade scores in relation to national norms. From an analysis of the data presented in this study and the data presented in an earlier study, (Davis and Trimble, 1977), it seems evident that the junior high school is the area where educational improvement efforts should be stressed.

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